International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 08 Issue 07 July 2025
DOI: 10.47191/ijcsrr/V8-i7-21, Impact Factor: 8.048
IJCSRR @ 2025
www.ijcsrr.org

Making Mobile Corn Dryer Using Temperature and Water Content Sensors Based on The Internet of Things

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ABSTRACT: This corn drying is done to increase the storage capacity and increase the economic value of the corn and the corn used has been shelled by reducing the water content to a maximum of 14% if the corn is said to be dry. The heating element here is very important to accelerate drying, the more elements used, the faster the time required for the drying process. To detect room temperature and humidity, a DHT11 sensor and a water content sensor are needed to determine the water content in the corn. The research method used in writing this article is a literature study by comparing the results of water content sensor measurements in experiments according to SNI. The results of the lowest water content measurement which has a water content of 13.4% with a time of only 120 minutes and 100 g of corn. The study of the water content value with the lowest value in the test can be used as a reference for designing a corn dryer prototype with a heating element using a DHT11 sensor and an Arduino Uno-based water content sensor.

KEYWORDS: DHT11 Sensor, Heating Element, Water Content Sensor.

INTRODUCTION

Corn is a staple food in several regions of Indonesia, corn also has a nutritional value such as carbohydrates, and protein that is not much different from rice and wheat. Corn can be used as raw material for industry and animal feed. At present, corn plants are increasingly being used, because almost every part of the plant can be processed for various purposes such as cornstarch, ethanol, acetone, compost, firewood, animal feed and processed materials for cooking oil.

The weather in Indonesia can experience changes that change. For these changes that cannot be ascertained at pre-harvest and post-harvest times. Corn is usually needed for food, corn is also useful for basic ingredients for animal feed, which can be exported abroad. This corn can be produced with technology obtained by the assessment and research institution for the scope of the research and development agency (Research and Development) for the fields of agriculture and universities, but there are still many that have not been applied. (Napitupulu and Atmaja, 2011: 32).

Harvesting and post-harvesting of corn can be seen from various characteristics such as the color of the yellow husk, the corn kernels are old and shiny, the color of the corn grains and the formation of the tissue that closes it changes color to black, so that when pressing the seeds with fingernails on the corn, the results cannot leave a mark, meaning that this content has a water content of 35%. After harvesting, corn should be opened to avoid various attacks by organisms with a corn water content of 17-20% until it can be easily shelled and dried immediately until the water content reaches 15% (Koswara, 2017: 82). Corn has a high selling price if the water content in the corn kernels meets the desired standards on the market. The Indonesian national standard (SNI 01-03920- 1995) for water content in corn is 13-14%. To obtain this standard, corn must go through a drying process. Drying techniques are currently widely used, from natural and simple methods with direct drying under sunlight, corn requires 3-5 days of drying to reach the standard water content of corn required (Antu, 2016:102).

This water content experiences a striking change in the first 1-2 hours and after that the longer it will decrease the higher temperature of 70 OC for this change in water content it is said that the speed is not slow because the water on the surface evaporates quickly than at a low position of 40 OC. This dryer carries out the process until the water content reaches a constant time change (Tuliza and Mursalim, 2011:72).

The making for processing in the dryer can be done with a tool that can save human energy, especially during the rainy season. Many use artificial drying with a temperature of 38OC - 43 OC, the tool used for this drying can regulate the temperature in the room and according to the desired water content in the corn kernels. This artificial drying is done for 32 hours and turns the corn seeds every 3 hours (Napitulu and Atmaja, 2011:33). The existence of the above research, the author can encourage the implementation of research

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and development on the use of targeted technology, so that it can facilitate the drying of corn seeds because the purpose of drying corn is to provide an increase in storage life and add economic value to corn and the corn used has been shelled by reducing the water content to a maximum of 14% if the corn is said to be dry. So that in writing this article will know the time needed during the drying process and the amount of initial water content and final water content contained in corn using the SKU-TH1052 sensor.

METHOD

The research and design of this final project will start from September 2024 to November 2024 at the University of North Sumatra. Tools used are laptop, screwdriver, cutting pliers, needle-nose pliers, combination pliers, multimeter, electric welding, grinder, and electric drill. Materials used are 16×2 LCD (Liquid Crystal Display), NodeMCU ESP8266 V.3, I2C Inter Integrated Circuit, iron, bolts, temperature and humidity sensor (DHT22), and jumper cable.

The type of this research is an experimental research conducted through two stages, namely the tool simulation stage and the testing stage. Research Stages are needs analysis, system design, testing and implementation. Needs analysis is carried out to determine the specifications of the application needs to be built. This stage will discuss the hardware and software used in the design of a vertical rotary corn dryer using nodemcu based on the internet of things. System design is is carried out based on the results of the existing system analysis, resulting in a new proposed model. System design is carried out through the stages of hardware design and software design. Testing stage, the program units will be unified and then tested as a whole. This is done to check the cohesiveness between the implemented system components. Implementation stage is the final activity of the new system implementation process, where this stage is the stage of placing the system so that it is ready to be operated and can be seen as an effort to realize the system that has been designed.

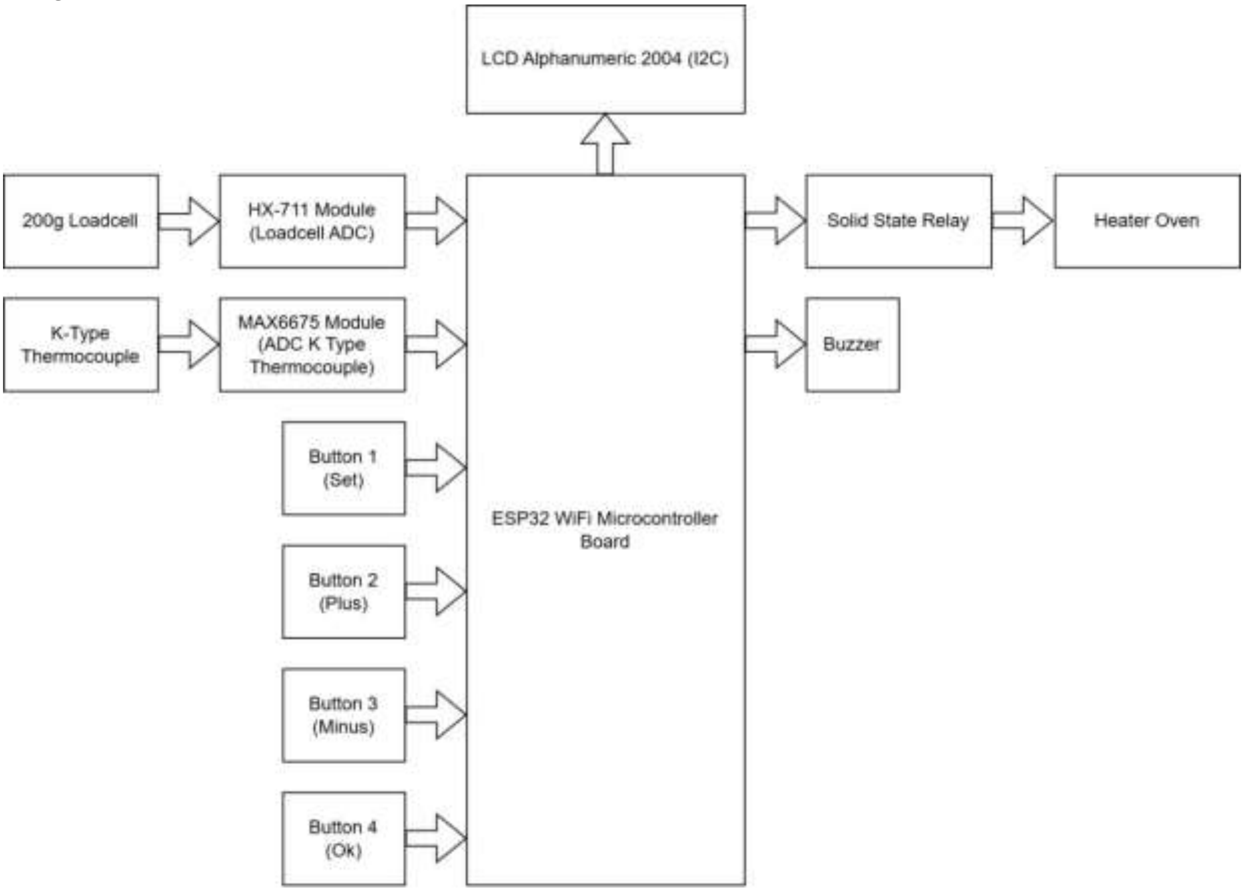

Figure 1

Hardware Circuit Design is a hardware that can be seen and touched physically. Figure 1 is the components used. The software programming stage is created through the Arduino IDE application and monitoring objects using an LCD display and connected to

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the program that has been created in the Arduino IDE application. Data Analysis, steps were taken for system testing and data collection, namely testing the performance of the DHT22 sensor and other components and testing how the tool works. The system flowchart is a data flow that describes how the activity of the tools working system runs. Figure 2 is the flowchart of this system.

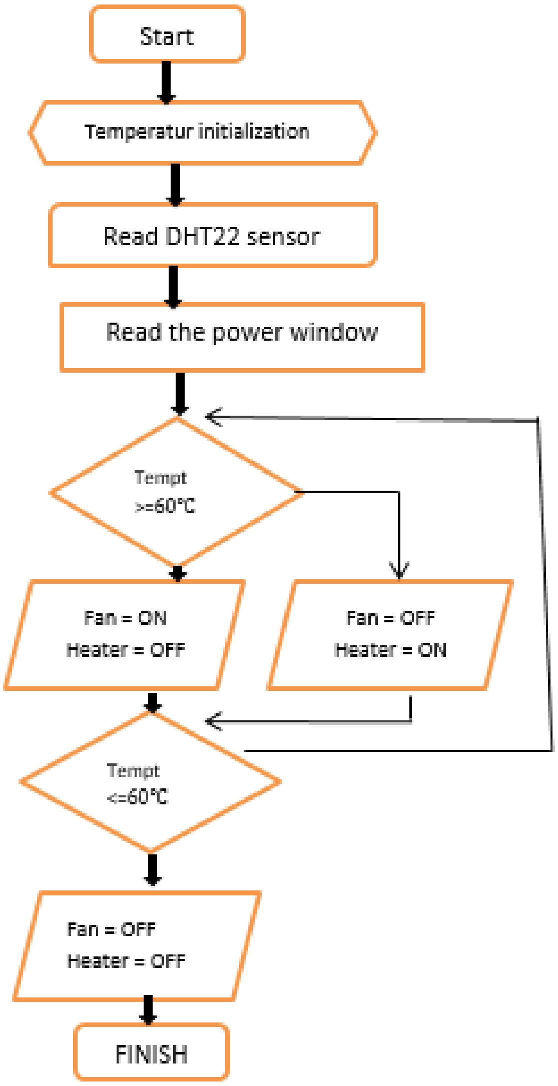

Figure 2

Hardware testing will be carried out to see each component installed whether it is in accordance with what it should be or not. The tests that will be carried out are testing the Arduino Uno program with components such as time sensors and temperature sensors that are already working with the measured parameters. Software testing will be carried out to see the program testing via the Arduino IDE interface on the LCD to control the components installed on the system are working properly. In this stage, the implementation of the planned system will be carried out. The system will be built according to the previously created design, starting from the hardware and software to be used, the placement of devices and sensors that have been determined, the design of the system to be created, and the determination of the location of the pump to be used.

System Realization

In this stage, the implementation of the planned system will be carried out. The system will be built according to the previously created design, starting from the hardware and software to be used, the placement of devices and sensors that have been determined, the design of the system to be created, and the determination of the location of the pump to be used.

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Testing, Evaluation, and Revision

At this stage, the planned and implemented system will be tested, evaluated, and revised continuously. The main goal is to continue to improve the system so that it can produce the desired results according to the information that has been obtained previously. The testing process will include sensor calibration, system configuration, and other relevant aspects.

Sensor Accuracy Testing and Real-Time Monitoring

Sensor accuracy testing aims to measure the level of accuracy of each sensor used in the system. The testing process will compare the results of sensor measurements with the standard measuring instrument. Each value produced by the measuring instrument will be sampled five times for each related sensor. In addition, real-time monitoring testing is carried out to verify the function of the monitoring system directly. This test involves simulating changes in water levels during system operation to ensure the system runs effectively. This research is the manufacture of a corn dryer measuring 50 cm x 37.8 cm x 32 cm which is used forstoring corn kernels to be dried.

RESULT

Monitoring Description of Corn Dryer Design

This research is the manufacture of a corn dryer measuring 50 cm x 37.8 cm x 32 cm which is used forstoring corn kernels to be dried. Figure 3 shows the results of the corn dryer design. There are several sensors in the drying system, namely temperature sensors and weight sensors, which are interconnected with the ESP32 WiFi Microcontroller and will be displayed on the Alphanumeric 2004 I2C LCD.

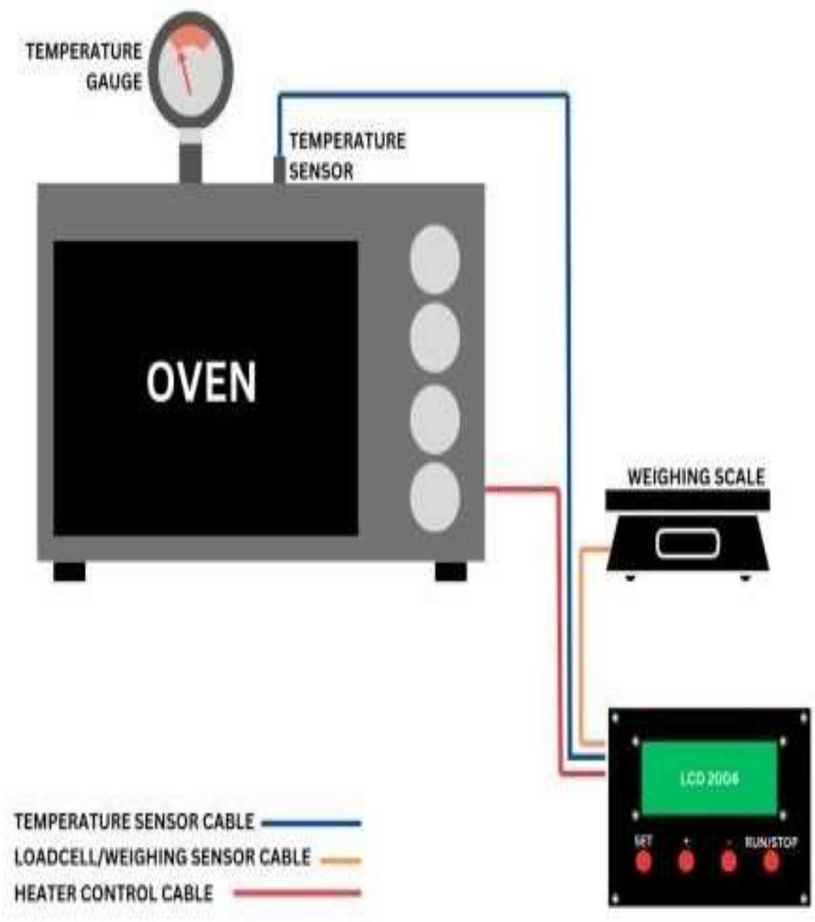

Figure 3

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Corn Dryer Data

1. Temperature Sensor Performance

Test Temperature sensor testing is carried out by comparing the room temperature level using a thermometer and the temperature sensor itself, the results are as shown in table 1. In table, a thermometer is used as a reference for the use of a temperature sensor. In the comparison ofmeasurements in table 1, the error value of the temperature measurement results on the thermometer and temperature sensor can be seen to be a difference of ±1.4%.

NO	Mini Digital Thermometer (°C) TS	Temperature Sensor (°C) TR	ERROR %
1	35,2	34,7	1,4
2	40,1	39,8	0,7
3	45,4	44,7	1,5
4	50,2	49,6	1,2
5	56,2	54,8	2,5
6	60,2	59,4	1,3
7	65,5	63,8	2,6
8	70,3	70,3	0,0
MEAN		1,4	

Table 1

Table Caption :

TS : Temperature Standart

TR : Temperature Sensor

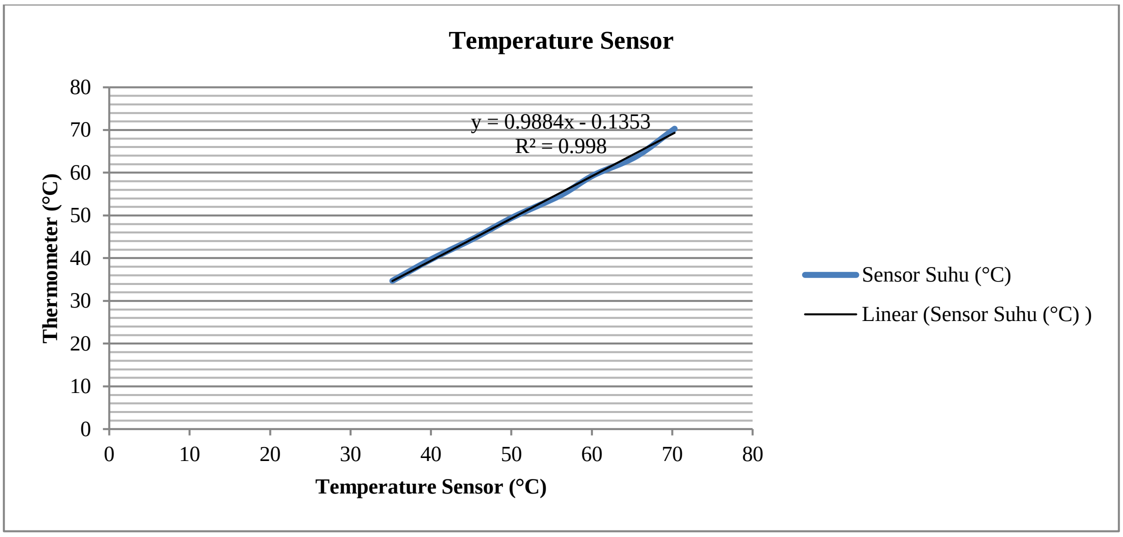

Figure 4

This graph shows a linear relationship between the temperature measured by the sensor (Y-axis) and the variables from the standard measuring instrument on the X-axis. Based on the regression equation y = 0.9884x - 0.1353, the slope is almost the same as 1 indicating that the sensor is quite accurate in reading the temperature compared to the standard measuring instrument. The coefficient of determination value $R^2 = 0.998$ indicates a very strong relationship between the sensor measurement data and its regression model. The data measured by the sensor is depicted by the blue line, while the black line shows the trend line of the regression results. This shows that the sensor can represent the temperature consistently and accurately according to the values from the standard measuring instrument.

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2. Blynk Performance Test

This test is carried out by checking whether BLYNK is connected or not. Figure 5 is a display on the blynk application, there are 3 buttons. The motor button functions to turn the power window on and off and the other 2 buttons are used to set the desired temperature and timer on the dryer.

Figure 5

3. Overall Tool Test Results

The overall test of this control tool aims to determine whether the devices on the tool can work properly or not when connected together and to make improvements to the tool when an error occurs or the tool's performance is less than perfect. It was found that the tool functions properly according to the given program set, the set temperature is 60°C. When the temperature is lower, the heater will be ON, and vice versa if the temperature is higher, the heater will be OFF with an initial corn water content of 23% until the corn water content becomes 14% is 2 hours 12 minutes. From the overall performance test of the tool, it was found that the overall function of the system was working well.

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Results of Dryer Tool Data

The table below shows the results of measurements with an initial weight of 100 grams and a temperature of 40°C with time variations. In the table 2 and figure 6 we can see that the initial volume or mass affects the drying time of corn, the longer the drying time, the more the weight is reduced.

No	Time (Minute)	Final Weight (gram)
1	10	86,4
2	20	85,18
3	30	83,79
4	40	82,41
5	50	81,03
6	60	79,64
7	70	78,97
8	80	76,35
9	90	75,08
10	100	73,95
11	110	72,75
12	120	71,67

Table 2

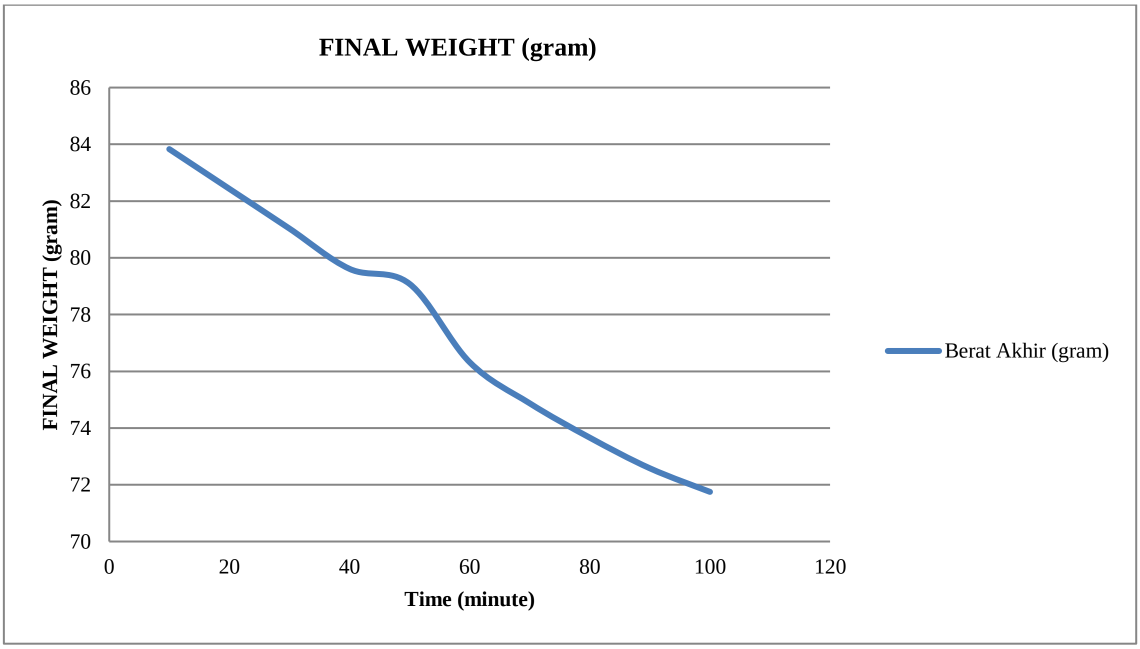

Figure 6

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Table 3 and figure 7 show drying corn with an initial weight of 100 grams and a temperature of 50℃. We can see that the initial volume or mass affects the drying time of corn, the longer the drying time, the more the weight of the corn is reduced.

No	Time (minute)	Final weight (gram)
1	10	86,6
2	20	85,23
3	30	83,83
4	40	82,43
5	50	81,03
6	60	79,61
7	70	79,08
8	80	76,32
9	90	74,87
10	100	73,66
11	110	72,58
12	120	71,75

Table 3

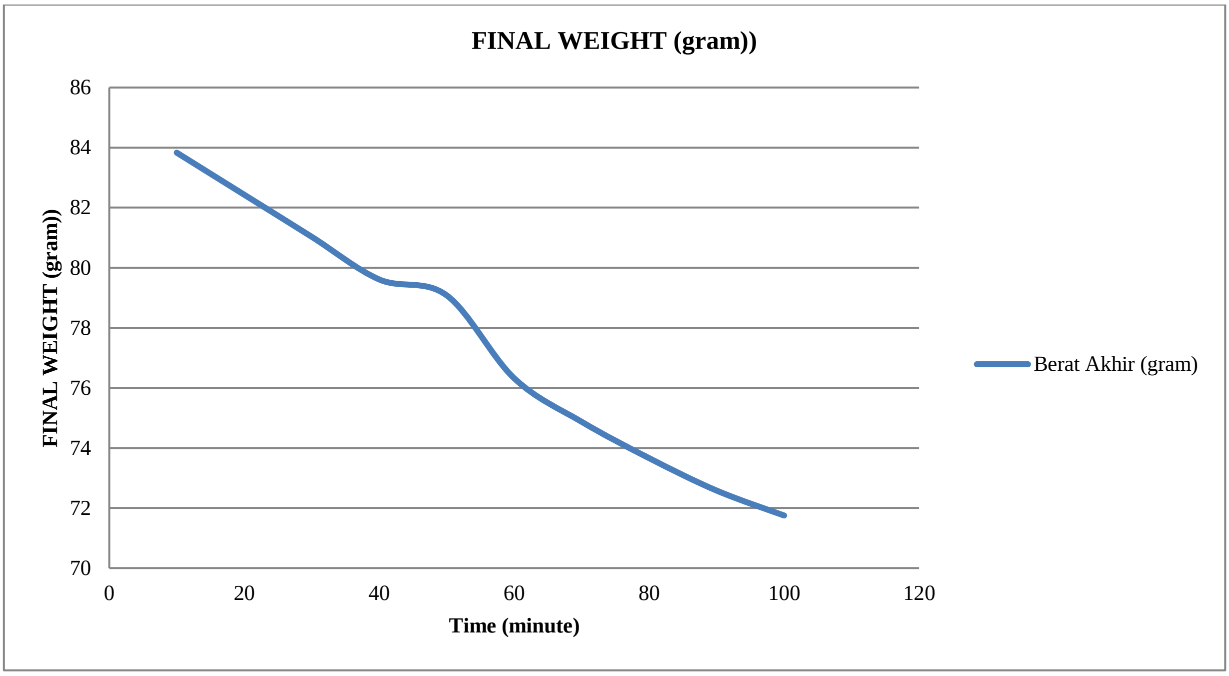

Figure 7

Table 4 and figure 8 show drying corn with a weight of 100 grams and a temperature of 60 °C. We can see that the initial volume or mass affects the drying time of corn, the longer the drying time, the more the weight of the corn is reduced.

No	Time (minute)	Final weight (gram)
1	10	86,8
2	20	85,63
3	30	84,17
4	40	82,7
5	50	81,24
6	60	80,58
7	70	77,91
8	80	76,22
9	90	75,08
10	100	73,87
11	110	72,98

Table 4

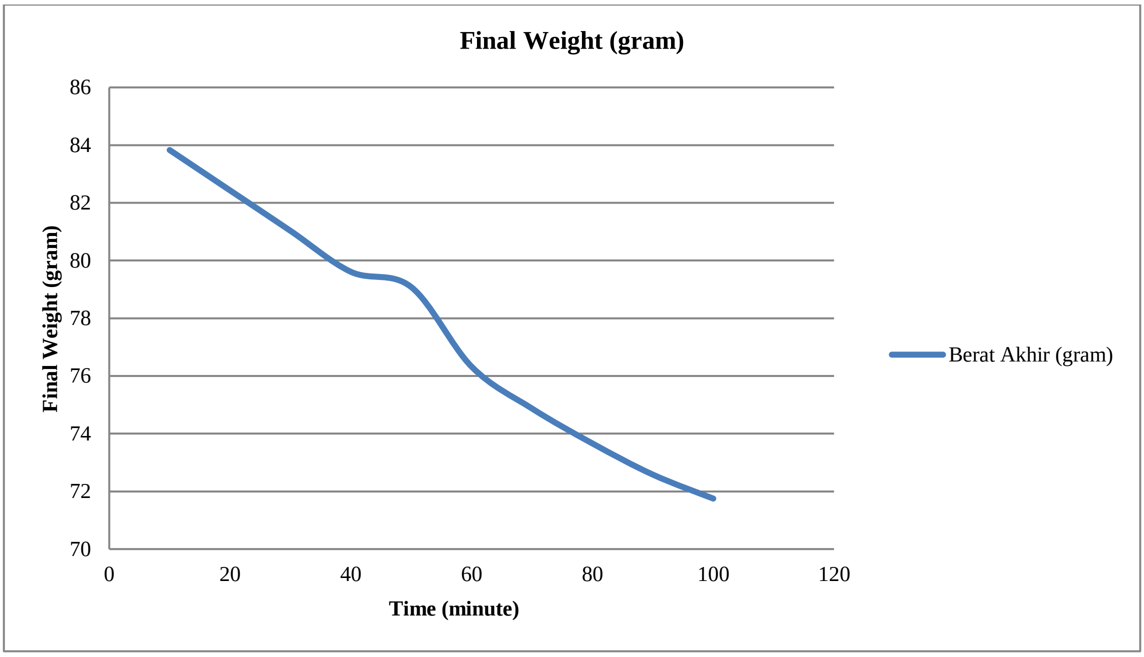

Figure 8

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Table 5 and figure 9 show drying corn with an initial weight of 100 grams at a temperature of 70°C. We can see that the initial volume or mass affects the drying time of corn, the longer the drying time, the more the weight of the corn is reduced.

No	Time (minute)	Final weight (g)
1	10	83,83
2	20	82,43
3	30	81,03
4	40	79,61
5	50	79,08
6	60	76,32
7	70	74,87
8	80	73,66
9	90	72,58
10	100	71,75

Table 5

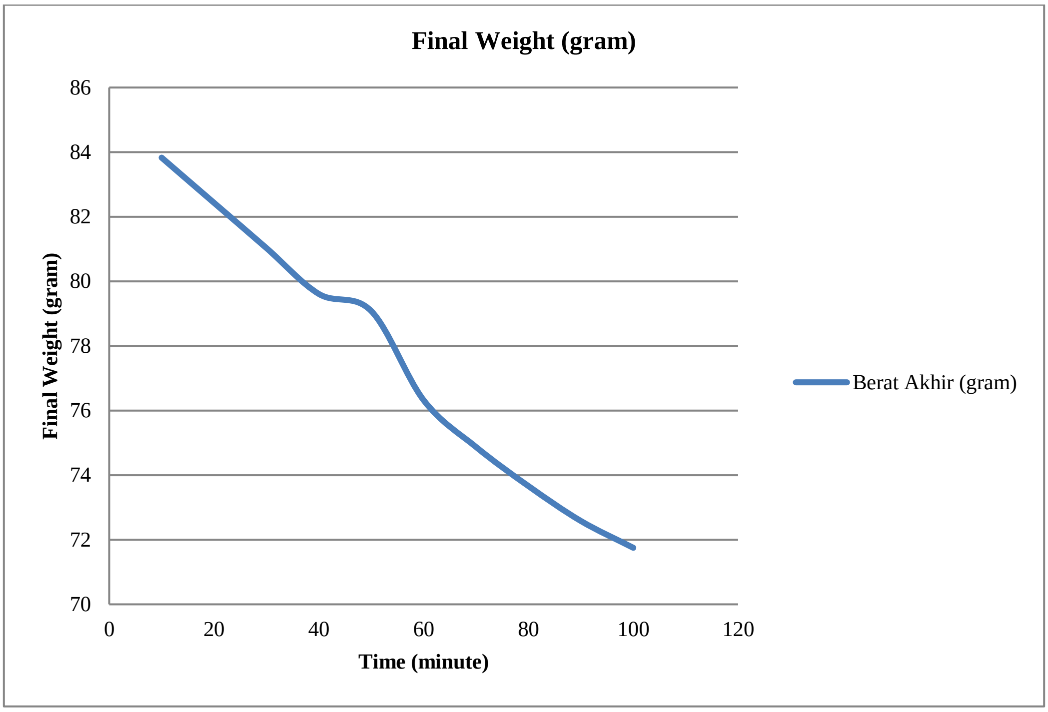

Figure 9

CONCLUSION

Based on the results of the research and analysis, it can be concluded that to detect room temperature and humidity using the DHT11 sensor. Heating elements are also needed in testing because the more heating elements, the faster the drying process and a blower is needed to distribute the heat in the room with settings using an Arduino Uno if the value is in accordance with the SNI standard, the dryer will automatically stop by itself. The method for this test is faster using a dryer than the conventional method because it takes longer.

This study has succeeded in designing a prototype of a corn seed dryer. This tool can dry corn seeds faster than regular drying (manually dried in the sun). In this study, 100 grams of corn grain samples were dried in a dryer with temperature variations of 40℃, 50 ℃, 60 ℃, and 70 ℃, all of which were able to reduce the water content in corn by 13% for 100 minutes - 120 minutes.In this study, the use of the Blynk application ran well and was very helpful in controlling temperature and time in the corn drying process.

REFERENCES

1. Antu.E, (2016), Experimental study of corn grain drying system with natural convection method to improve the quality of agricultural production in Gorontalo
2. Arifin, Jauhari, Leni Natalia Zulita, Hermawansyah. (2016). Design of Automatic Murottal Using Arduino Mega 2560 Microcontroller. Bengkulu Dehasen University Bengkulu.
3. Aryanto A.W, Falani A.Z, Winardi S (2016), Automation of Power Window With Remote Control Using Arduino.
4. Hafid, Krisnandy.L, Mahaputra (2018) design and manufacture of rotary batch type corn kernel drying machine.
5. Herlina, N. & Fitriani, W. (2017). Effect of Percentage of Leaf and Male Flower Pruning on Corn (Zea mays L.) Yield.
6. Kurnianto.HR, Aji.WS (2021). Chloro Fluro Carbon (CFC) Gas Monitoring System in Air Conditioner (AC) Using Arduino and MPX5700AP Sensor.
7. Muliawan Rahmat, Patang, Muh. Rais, (2019) Corn Seed Drying Test (Zea Mays. Sp) Using a Tray Dryer
8. Okatama I, (2016) Analysis of Melting of Polyethylene Terphtalate (Pet) Plastic Waste into Plastic Seeds Through Testing of Plastic Melting Tools.
9. Puspasari.F, Satya.TP, Oktiawati.U.K, Fahrurrozi.I, and Prisyanti.H, (2020) Analysis of the Accuracy of the Arduino-based DHT22 Sensor System against Standard Thermohygrometers.
10. Satriadi.A, Wahyudi, and Christiyono.Y (2019) Design of Home Automation Based on Nodemcu.
11. Suryono, Supriati. (2019). Design of a Programmable Timer with a Three-Color Light Display as a Timer for Seminar Activities. Journal of Semarang State Polytechnic Vol. 15 No. 3.
12. Syahrul, Fitra.W, Suartika.I.M, Sukmawaty, (2016) Drying Air Temperature and Corn Kernel Mass in Fluidized Dryer.
13. Syarifuddin M.A, Firman L.M, (2018), Experimental Study of the Use of Vertical and Horizontal Cylinder Drying ChambersFluidized Deep Type Paddy Dryer Machine
14. Tresnajaya M.S, Partha C.G.I, Sukerayasa I.W (2020), Utilization of Exhaust Fan Air as a Wind Power Generator with the Addition of Wind Tunnel Based on Atmega 2560.

Cite this Article: Natalia, K., Tarigan, K., Situmorang, M. (2025). Making Mobile Corn Dryer Using Temperature and Water Content Sensors Based on The Internet of Things. International Journal of Current Science Research and Review, 8(7), pp. 3326-3336. DOI: https://doi.org/10.47191/ijcsrr/V8-i7-21